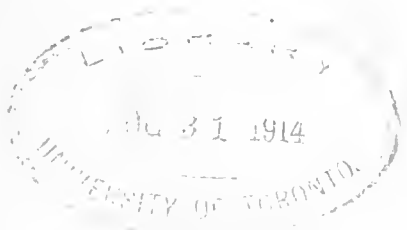

University of Cambridge

SOLAR PHYSICS OBSERVATORY

FIRST ANNUAL REPORT OF THE DIRECTOR OF THE SOLAR PHYSICS OBSERVATORY TO THE SOLAR PHYSICS COMMITTEE

1913 APRIL 1—1914 MARCH 31

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First Annual Report of the Director of the Solar Physics Observatory

1 *June* 1914.

The Vice-Chancellor begs leave to publish to the Senate the following Report which the Solar Physics Committee have received from the Director of the Solar Physics Observatory:

The Report here presented refers to the year 1913 April 1 to 1914 March 31; and as it is the first report on the Solar Physics Observatory since its transference on April 1, 1913 to the charge of the University of Cambridge, it has seemed desirable to preface it by a statement indicating the circumstances in which the Observatory is now administered.

The Solar Physics Observatory was established at South Kensington in 1879 under the direction of the Solar Physics Committee, a body which was appointed by the Committee in Council on Education and was subsequently attached as an advisory committee to the Board of Education. In the year 1885 it came under the direction of Sir Norman Lockyer, K.C.B., and he continued to serve as Director or Acting Director until 1913.

On April 1, 1913 the Observatory was transferred from South Kensington to Cambridge under conditions which were specified in a letter addressed by the President of the Board of Education to the Vice-Chancellor of the University published in the *Cambridge University Reporter* of November 13, 1911 (page 236). The University, having accepted the responsibility of administering an annual Treasury Grant for carrying on investigations at or in connection with the Solar Physics Observatory, appointed a Solar Physics Committee to administer the Grant and to act in an advisory relation to the Director with regard to the observations and other scientific work of the Observatory (*Reporter*, May 14, 1912, p. 999). The body so appointed consists of (*a*) the members of the Observatory Syndicate, (*b*) the Astronomer Royal and the Director of the Meteorological Office as *ex officio* members and (*c*) four additional members not necessarily members of the University, each holding office for four years.

The Solar Physics Committee when first appointed in June 1912 consisted of the following members:

The Vice-Chancellor.
Sir G. H. Darwin, Plumian Professor.
Sir R. S. Ball, Lowndean Professor.
Dr T. J. I'A. Bromwich.
Mr P. C. Gaul.
Dr J. W. L. Glaisher.
Mr H. Darwin.
Dr F. W. Dyson, Astronomer Royal.
Dr W. N. Shaw, Director of the Meteorological Office.
Sir J. Larmor, Lucasian Professor.
H. F. Newall, Professor of Astrophysics.
Dr E. W. Hobson, Sadleirian Professor.
Mr J. W. Capstick.

Dr A. Schuster.
Sir T. L. Heath, K.C.B.
Sir David Gill, K.C.B.
Prof. H. H. Turner.

It has now to be recorded with deep regret that by death the Committee have lost the valued services of Sir George Darwin, Sir Robert Ball, and Sir David Gill.

At the date of this Report the Committee is constituted as follows:

The Vice-Chancellor.
Sir J. Larmor, Lucasian Professor.
H. F. Newall, Professor of Astrophysics.
Dr J. W. L. Glaisher.
Mr H. Darwin.
Dr E. W. Hobson, Sadleirian Professor.
Dr T. J. I'A. Bromwich.
A. S. Eddington, Plumian Professor.
H. F. Baker, Lowndean Professor.
Mr A. Berry.
Mr J. G. Leathem.

Dr F. W. Dyson, Astronomer Royal.
Dr W. N. Shaw, Director of the Meteorological Office.
Sir T. L. Heath, K.C.B.
Major E. H. Hills, C.M.G.
Prof. H. H. Turner.
Dr A. Schuster.

Site.

By the purchase of an additional piece of land the grounds of the Observatory have been extended southwards down to the Madingley Road on the west side of the entrance drive. The University is indebted to St John's College not only for their readiness to further the acquisition of the site, but also for a generous contribution towards the expenses of installing the equipment. By the partial demolition of the old boundary hedge convenient sites were afforded for the various buildings required for the instruments transferred from South Kensington. In particular an excellent position has been found for the spectroheliograph; by the felling of four trees on the Observatory drive a clear horizon has been secured to the east and north-east so that if desired the sun can be observed from a few minutes after sunrise throughout the summer months. Observations already made shew that the atmospheric conditions are very satisfactory for the photographic records of solar flocculi and prominences.

Selection of Instruments to be utilized at Cambridge.

The equipment of the Solar Physics Observatory at South Kensington comprised the following instruments, in addition to various others which are the property of Sir Norman Lockyer:

a spectroheliograph, including a Foucault heliostat with a silvered mirror of diameter 18 inches, and a photovisual triple objective of aperture 12 inches and focal length 19½ feet;

two prismatic cameras:

a refractor equatorially mounted by Cooke, of aperture 10 inches;

a 6-inch concave grating ruled by Rowland, of aperture 6 inches and radius 21½ feet;

a considerable collection of apparatus available for spectroscopic and photographic work, for use in the laboratory and for eclipse purposes;

the 3-foot reflector with silvered mirror made by Dr Common, the property of the Science Museum.

In considering for which of these instruments provision was to be made at Cambridge, it was decided to adopt the policy of fusing the work of the Solar Physics Observatory with that which has hitherto been carried on in the Astrophysical Department of the Cambridge Observatory. It followed that it was unnecessary to make provision at Cambridge for instruments in the South Kensington equipment which served purposes already met by instruments in the Astrophysical Department, e.g. the 25-inch equatorial (the Newall telescope), the McClean Solar Instruments, and the Huggins equatorial with its 15-inch refractor and 18-inch speculum reflector. In these circumstances the Committee gladly availed themselves of a suggestion of the President of the Board of Education and put at the disposal of Sir Norman Lockyer for use in his Observatory at Sidmouth the 10-inch equatorial refractor and its accessory apparatus together with sundry pieces of apparatus for laboratory purposes. A prismatic camera with two prisms 10 inches in diameter and accessory apparatus have been sent to Sir Norman Lockyer, on loan to be returned to Cambridge when he ceases to have a use for them.

The Board of Education have kindly given their consent to a loan of the 36-inch reflector above mentioned to the Solar Physics Observatory at Cambridge for a term of years.

The New Buildings.

The new buildings, which have been erected by Messrs Sindall, were designed by Mr T. D. Atkinson, Architect, to satisfy the scientific requirements indicated in detail by the Director, in consultation with the Solar Physics Observatory (Building) Syndicate. They include the following:

A. The Laboratory building, a slate-roofed structure in brick, which forms a large extension at the west end of the Astrophysical Building erected in 1909 in connection with the Huggins Dome.

The new part comprises under one roof the following rooms:

On the ground floor:

A laboratory, of area approximately 815 square feet, of peculiar shape to accommodate the mounting of the Rowland concave grating. Its largest dimension is 42 feet and its height is 11 feet.

A photographic dark room 8 feet by 6 feet.

A record room for storage of photographic negatives, with wall space equivalent to that of a room 20 feet by 6 feet.

A lavatory &c.

A workshop and electric battery room, 20 feet by 18 feet.

And the living rooms of the resident attendant's house.

On the first floor:

Three working rooms for the staff, 20 feet by 15 feet, 12 feet by 14 feet and 12 feet by 13 feet.

A store room.

And the bedrooms of the resident attendant's house.

The resident attendant's house is separated from the rest of the building by a continuous brick wall from top to bottom, and access to it is gained by a separate door.

The design of the Laboratory aims at securing even temperatures by providing as far as possible that its walls shall in no case form the actual external walls of the building in contact with the open air or exposed to sunshine.

Access to the laboratory and workshop is gained through the main entrance of the Astrophysical Building constructed in 1909, and the large room (20 feet by 20 feet) in the 1909 building serves as library and general computing room.

A passage has been arranged, lying east to west, from one end of the whole building to the other, the total length available, when desired, for an unimpeded beam of light, being 125 feet.

In the roof of the new building a skylight has been provided to light the upper passage and to admit when desired a beam of sunlight or starlight, to be directed by means of a polar siderostat into the laboratory through a trapdoor in its ceiling. Provision has also been made for admitting a horizontal beam of sunlight through the north window of the laboratory directly on to the Rowland grating spectograph, the dimension of the laboratory in the line of the beam being 42 feet, and being accordingly amply sufficient for the production of unastigmatic images. The north window also forms the outer window of a fume cupboard, which serves to carry away fumes from any electric arcs or flames that may be inserted in the path of the sunbeam.

Attention was also given to provide suitable wall spaces in the different parts of the building so as to accommodate the various large glass-doored cases for instruments and apparatus.

The water supply has been extended to the Laboratory and to the resident attendant's house.

The Laboratory Building is heated by hot water and lighted with electric light. The gas supply has been extended to the Laboratory and to the kitchen of the resident attendant's house. Electric power has been brought from the Supply Company's mains into the workshop, where a motor generator of 10 horse-power has been erected to give continuous current for charging accumulators and for use in the laboratory. An electrically driven fan has been provided for ventilating the laboratory, the dark room, the workshop and battery room, and the fume cupboard.

The new laboratory building was begun in September 1912 and completed by the end of February 1913, ready to receive the apparatus transferred from South Kensington at the end of March and beginning of April 1913.

B. The spectroheliograph house, a slate-roofed structure with wooden walls provided with suitable air-spaces.

It had been decided to erect the spectroheliograph for immediate work in the form in which it was used at South Kensington, and at the same time to make provision for remodelling and enlarging it. Accordingly plans for the new instrument were developed so as to shew the size of the building which will be required for it. And the dimensions so arrived at, viz. 43 feet by 14 feet, have been adopted.

The house for the heliostat was transferred from South Kensington and was erected on the new site in April 1913. It has been placed about 30 yards to the south of the Astrophysical Building and the heliostat within it reflects a beam of sunlight southwards.

The new building for the spectroheliograph has been placed with its long dimension in the meridian at the proper distance from the heliostat and to the south of it. The northern end of the roof was designed so as not to impede the sunlight near the winter solstice from reaching the heliostat, and special attention was given to provide ample circulation of air within the actual wooden walls and the roof of the building.

The new building was completed in August 1913, and the spectroheliogragh was at once installed in it.

C. The reflector dome, a brick building, with movable dome (27 feet in diameter) provided with a double shutter made by Messrs T. Cooke and Sons in their standard form, with iron framework covered with papier mâché.

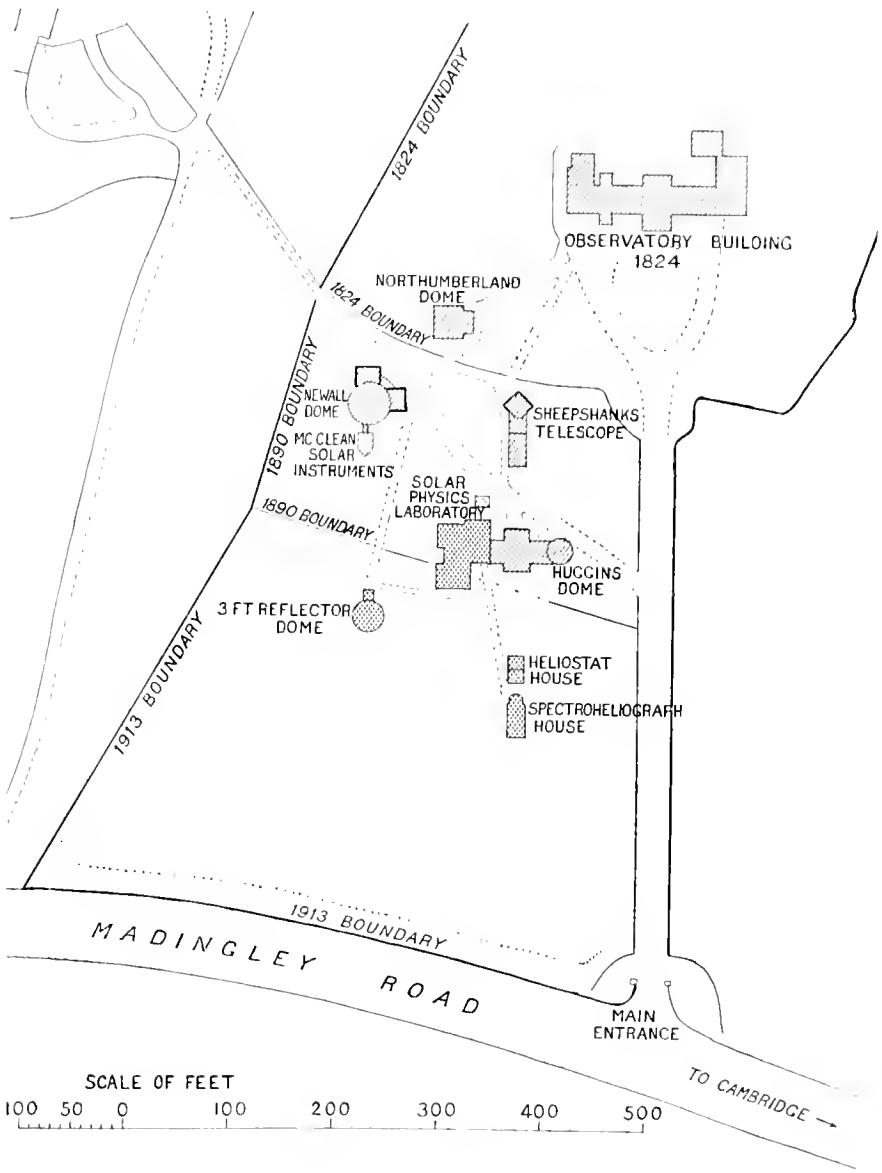
The brick building and foundations for the reflector, with an iron-lined well for the driving weights of the clockwork, were ready to receive the dome in March 1913, and the heavy parts of the mounting of the reflector were moved into it in July 1913. The dome

was not completely erected until September 1913. Some alterations in the mounting of the reflector were made in the autumn to facilitate complete counterpoising of the moving parts The instrument has been erected in the present year, and is now ready for the completion of the wood block flooring of the dome and for the erection of the movable staging which has been designed for giving the observers access to the eyepiece of the instrument.

Provision has been made in the porch of the dome for a small chamber (9 feet × 9 feet) with a cement floor properly sloped for automatic draining, to facilitate the processes of re-silvering the 36-inch mirror when required.

D. There are still some small building operations required to complete the installation, such as a pillar and shed for a heliostat on the north side of the laboratory, and a concrete floor with movable shed for experimental trials of new instrumental methods. These will be completed as opportunity offers after the main instruments are provided for.

The accompanying plan shews the positions of the various buildings in the grounds of the Observatory and their relation to the buildings of the older Observatory.



Transfer of the equipment from South Kensington.

The actual transfer of the equipment from South Kensington to Cambridge was accomplished without a single accident by means of motor vans. The greater part was moved at the end of March and the beginning of April 1913. The heavy parts of the reflector were moved in July 1913. The mirror itself was stored in the Science Museum until March of the present year, when it was safely moved to Cambridge and erected in the new dome provided for it.

The Director desires to record his grateful appreciation of the most helpful arrangements made by Mr F. G. Ogilvie, C.B., Director of the Science Museum, to facilitate the transfer.

Regulations and Staff.

Regulations were drawn up in consultation with the Solar Physics Committee for the administration of the Observatory, and under these regulations the staff was appointed. A pension scheme has also been formulated.

The staff is now constituted as follows:

Director	H. F. Newall, Professor of Astrophysics.
Assistant Director	F. J. M. Stratton.
Observer in Meteorological Physics	C. T. R. Wilson.
First Senior Observer	F. E. Baxandall.
Second Senior Observer	C. P. Butler.
First Junior Observer	W. E. Rolston.
Second Junior Observer	W. Moss.
Resident Attendant	W. H. Manning.
Assistant in charge of the Workshop	L. J. Stanley.

On his appointment as Assistant Director, Mr Stratton resigned the post of Assistant in Astrophysics, and with his resignation the post ceased to exist. He has since been appointed University Lecturer in Astrophysics. Messrs Baxandall, Butler, Rolston, and Moss had been on the staff at South Kensington, and on their appointment on the new staff they took up duty at Cambridge on April 1, 1913. Mr Wilson joined the staff on October 1, 1913.

The energies of the staff during the year have necessarily been directed in great measure to getting the Observatory into working order. A plan of regular investigations was, however, initiated at the outset, the aim being that the staff should at once be engaged in systematic work not involving fresh observations, and that observational work, at any rate at night, should be more or less in abeyance until the general arrangement of the equipment was nearly completed. The work has been liable to frequent interruptions when active operations were required in arranging apparatus, making catalogues and inventories, etc. But good progress has been made in the work undertaken. First, a study of the areas and life history of sunspots from the Greenwich records of measurements and groupings, 1889—1901, has been begun; and secondly, in preparation for an atlas of typical stellar spectra with assigned chemical origins of lines, the stock of 1145 negatives of stellar spectra that have been transferred from South Kensington has been systematically reviewed and a new descriptive catalogue of the spectra has been compiled for office use. In this review of the negatives a representative selection of 81 negatives has been picked out and sent to Sir Norman Lockyer for use at Sidmouth.

The following paragraphs summarize the work done in the Solar Physics Observatory during the year 1913 April 1 to 1914 March 31; and as a consequence of the arrangements by which the work hitherto done in the Astrophysical Department is now carried on under a single administration with the Solar Physics Observatory (*University Reporter*, February 18, 1913, p. 663), the report deals also with the work carried out with the Newall Telescope, the Huggins instruments, and the McClean Solar equipment.

A. Stellar work.

The Newall Telescope. Spectrograms of 10 red variable stars have been obtained, including 11 spectrograms of *o* Ceti. A photograph of the spectrum of Nova Geminorum No. 2 was secured on one night, April 16, 1914, when the star's magnitude was 9·0. Visual observations of the spectra of Nova Aurigæ, Nova Persei No. 2, Nova Lacertæ, Nova Geminorum No. 1 and Nova Geminorum No. 2 have been made.

The discussion of the spectrograms of Nova Persei No. 2 secured by Professor Newall in 1901 has been completed, but the publication of the results is postponed pending the completion of the discussion of the series of spectra of Nova Geminorum No. 2. The measurement and reduction of the Cambridge plates of the last named star has been completed by Mr Stratton and the discussion of results is nearly finished. Gaps in the series of spectra have been filled by negatives which have been sent to Cambridge by the Directors of the Allegheny and Bonn Observatories. These negatives have proved to be of great value and interest in settling some points which could not be determined from the Cambridge plates alone, in view of the conflicting evidence published from other Observatories. The discussion of the whole material thus available is being prepared for press.

A preliminary note by the Director and Mr Stratton "On enhanced (spark) lines in the early spectrum of Nova Geminorum No. 2" has been published in the *Monthly Notices* of the Royal Astronomical Society, Vol. 73, p. 380.

The Huggins Telescopes. The work with these instruments has been hindered by an unfortunate accident by which the prism of special construction designed for the new spectrograph was broken, when nearly completed, in the workshop of Messrs Hilger in December 1912. A second prism has been made which seems to be of excellent quality. The new spectrograph, which was designed by the Director, has been constructed by the Cambridge Scientific Instrument Company and is now being adjusted. It is used in connection with the Huggins refractor, of aperture 15 inches. In the tests, spectra of the following stars have been secured: α Canis Minoris, λ Orionis, α Aurigæ, β Aurigæ, α Lyræ, α Canum Venaticorum, α Cygni. The work has been in the charge of Mr Rolston.

Studies of stellar spectra.

The whole collection of stellar spectra transferred from South Kensington has been recatalogued and described in a way that will be helpful for office reference. The best specimens of various typical spectra have been selected for photographic enlargement, and many of them have been already enlarged for the purpose of recording the chemical origin of as many lines as possible in the typical spectra.

The work of identification of lines involves much measurement and critical study, and the utilisation of the combined material available in the photographs taken with objective prisms at South Kensington and those taken with the slit spectrographs at Cambridge will be very serviceable in the preparation of an atlas of stellar spectra.

The following papers, which have been published in the course of the year, give the results of special studies, which have been made by Mr Baxandall, with the frequent assistance of Mr Rolston.

'On the presence of Europium lines in stellar spectra.' (*Monthly Notices, Royal Astronomical Society*, Vol. 74, p. 32.)

Certain of the more conspicuous lines in the spectrum of α Canum Venaticorum which have been found by Belopolsky to be subject to periodic variation in intensity, are shewn to be due to Europium, an element that usually plays only a minor part in celestial spectra.

'On the presence of certain lines of Magnesium in stellar spectra.' (*Proc. Camb. Phil. Soc.* Vol. 17, p. 323.)

Evidence is given for the probable occurrence of certain lines, attributable to Magnesium, in the spectra of α Cygni and α Canis Majoris. These lines were recorded by Fowler as occurring in the spark spectrum of Magnesium though they do not belong to the new series of lines discovered by him. The well-known spark line of magnesium at wave length 4481·3 is conspicuous in the above-named stars.

'On the enhanced lines of Manganese in the spectrum of α Andromedæ.' (*M. N., R. A. S.* Vol. 74, p. 250.)

This spectrum is placed in sub-class Ao in the Harvard classification, with an affix *p* to indicate that the spectrum exhibits peculiarities distinguishing it from the normal stars of the group. It is here shewn that most of the lines which constitute the characteristic peculiarity agree closely in position with the enhanced lines of Manganese. The star α Andromedæ seems to be nearly unique among the brighter stars, in having the enhanced lines of Manganese so conspicuously developed; μ Leporis (magnitude 3·5) is probably the only other recorded instance of this peculiarity.

B. Solar Work.

The Spectroheliograph. This instrument was installed on the new site in September 1913 and routine observations were begun at the end of October. Photographs of the Sun's disc and limb in $K_{2\cdot3}$ light have been obtained on all possible occasions.

Pending the completion of the new instruments, the spectroheliograph has been remounted in the same form as at South Kensington, giving a solar image about $2\frac{1}{4}$ inches in diameter. New platinoid jaws have been made for the primary slit and new diaphragms have been fitted throughout the instrument to minimise the amount of scattered light.

Very little evidence of activity was visible on the photographs obtained up to the middle of March, but since that time several spots with accompanying bright flocculi indicate the renewal of activity, and prominences have been recorded on most of the photographs of the limb. The work has been in the charge of Mr Butler, assisted by Mr Moss.

In accordance with the arrangement made with the Indian Government 400 spectroheliograms have been received from the Director of the Kodaikanal Observatory shewing the solar disc in calcium light for the period 1912 October 1 to 1913 December 31. For the year 1913 spectroheliograms are available for 327 days.

The McClean Solar instruments. The new apochromatic object glass of aperture 12 inches and focal length 59 feet has been delivered by Messrs T. Cooke and Sons to replace the defective one which has been in use during the last four years. It has been tested by the Hartmann method, and the results shew that, though some final retouching may be required to give the best results, the homogeneity of the glasses which has proved so difficult to obtain in the Jena glass-works is very satisfactory.

The equipment has been used in securing a series of photographs of the whole solar spectrum from wave length 3900 to 6590 during the months of protracted minimum of sunspots for later comparison with similar photographs to be obtained in the approaching maximum.

Spectrograms of the orange region λ 6300 which were taken with the equipment in its early state in July and August 1908 have been measured. These photographs contain the telluric lines of oxygen, which have been used as standards of reference for the shift of solar lines, as in Duner's observations. They were taken with the object of making a closer study of the differences of wave length in the light from different parts of the sun's disc, and they give material for comparison between the light from the centre of the sun's disc and that from

points at the sun's limb at the east and west extremities of the sun's equator and at the north and south poles. The photographs have been measured and discussed by Mr R. Rossi, research student of Trinity College.

Mr Brunt, Isaac Newton Student, left the Observatory in September 1913 to take up a mathematical lectureship in Birmingham University. The results of his work have been published in two papers:

"On anomalous dispersion in the Solar Atmosphere" (*Monthly Notices*, R. A. S., Vol. 73, 568).

"On the Sun's Magnetic Field" (*Astronomische Nachrichten*, Vol. 196, 169).

One of the Zeiss Comparators has been lent to Mr Hubrecht for the measurement of further sets of plates secured by him with the McClean solar instruments in June 1914.

Study of areas and life history of sunspots 1889—1901.

The sunspots in the Greenwich records 1889—1901 have been tabulated according to length of duration and latitude. For this and other purposes the Greenwich ledgers have been mounted in the form of a card catalogue. The daily areas of recognized (lettered) spots in each group have been abstracted from the daily records, and the variation of area of groups and lettered spots have been tabulated according to the duration of the various spots whose visible life was spent between longitudes -65° to $+65^\circ$ from the central solar meridian. The variation of area of recurrent spots without companions has been studied. The material is completed for discussion; and further material is being tabulated for special studies of distribution of groups and spots. The work was begun by Messrs Butler and Moss, and has been carried on by Mr Moss alone.

C. Meteorological Physics.

Investigations in Atmospheric Electricity.

A method has been developed by Mr Wilson for measuring with one and the same apparatus the charge per square metre of the ground (or in other words the potential gradient at ground level) as well as the current from the atmosphere into the ground, whether this be due to ions moving under the action of the field or to the fall of charged raindrops, &c.

In the middle of a suitable field in an exposed situation in the neighbourhood of the Observatory a circular earth-covered conducting test-plate of diameter 20 inches has been fixed upon insulating supports in a small circular pit, its surface being level with the surrounding ground, from which it is separated by a narrow air gap. The test-plate is connected by means of a specially insulated wire to measuring apparatus contained in a small hut at a distance of about 40 feet; and it can be exposed to the atmosphere or screened from its electrical field by means of a movable earth-connected cover worked from the hut.

Numerous measurements in all kinds of weather have been made of the charge on the test-plate and of the current through it, by a method identical with that described in the *Proceedings of the Royal Society* (1908), Vol. 80, 537. In this method the compensating charge which has to be supplied from a condenser of variable capacity to keep the potential of the test-plate at zero is measured.

The apparatus was found to give trustworthy results, but as it is desirable to have a direct-reading system which can ultimately be made self-recording, a suitable instrument has been devised by Mr Wilson for the purpose, in which the compensation is automatic. The insulated wire from the test-plate above described is connected to earth through a special type of capillary electrometer, whose readings at any moment give automatically a measure of the total quantity of electricity which has traversed it, while the potential of the test-plate remains throughout at zero.

If the test-plate be left exposed to the atmosphere, the cover being merely momentarily replaced at convenient intervals of time, then the change of reading of the capillary electrometer during the process of covering or uncovering gives a direct measure of the charge on the exposed earth-connected test-plate at that moment, and hence of the potential gradient at ground level; while the difference of two successive readings made with the test-plate covered gives the charge which has entered the test-plate from the atmosphere in the interval during which the plate has been uncovered, whether due to conduction or convection currents. While the plate is uncovered, the changes of reading are a measure of the total integrated current (conduction + convection + displacement).

Tests made in the laboratory shewed that with one terminal earthed the displacement over a considerable range was proportional to the charge supplied to the other terminal (about two scale divisions of the microscope micrometer scale for one electrostatic unit), while the potential remained equal to zero within a few thousandths of a volt; the reading remained constant if no charge was introduced and the instrument responded to very rapid changes in the charge.

The electrometer was also tested when attached to the apparatus in the field. In weather that happened to be showery, the instrument followed in a very satisfactory way the rapid changes in the potential-gradient and in the charge carried down by the rain.

Simple appliances are to be erected for following extremely small and rapid changes in the electric field. The tests made with a capillary electrometer of the form devised by Mr Wilson shew that such an instrument will be very suitable for the purpose of these measurements, and the necessary arrangements will be much simplified by the use of it.

Experimental work on ionising radiations.

A number of stereoscopic photographs have been obtained, by Mr Wilson, of the clouds condensed along the tracks of ionising particles traversing air supersaturated with water vapour. The advantage of the stereoscopic effect in removing ambiguities in the interpretation of the photographs and in permitting the disentangling of interlacing tracks is most marked. Improvements are now completed in the arrangements for adjusting the time intervals between the expansion of the saturated air, the passage of the ionising rays, and the passage of the spark used to illuminate the clouds.

The principal progress made has been in the study of ionisation by X rays and beta rays.

D. Laboratory Experiments.

The Rowland Concave Grating.

The concave grating has been got into working order. The main part of the mounting was transferred from South Kensington. New rails have however been provided for the carriages of the grating and camera to run upon. These are formed on the flanges of steel girders supported by adjustment blocks on brick pillars, and an additional rail has been added so that stigmatic images may be obtained in the principal focus of the grating by the use of a collimated beam incident upon the grating.

The instrument is in the charge of Mr Butler, who has been carrying out experiments to secure the best adjustments of the grating camera for the eclipse observations in August next.

Work has been carried out by Mr Rossi on the widening of the lines in the hydrogen spectrum under varying conditions.

E. Miscellaneous.

Preparations for the total eclipse of the Sun 1914 August 20—21.

Preparations are being pressed forward for the observations of the eclipse in August next.

An expedition, including the Director, Mr Stratton, and Mr Butler, together with Mr R. Rossi as a volunteer observer, is to be stationed near Feodosia on the south coast of the Crimea.

Library, Circulation Lists, etc.

The arrangement of the library, in the charge of Mr Rolston, has been made in a preliminary manner, and the appliances for a card catalogue have been procured in readiness for the cataloguing of the books.

The list of corresponding observatories and institutions has been revised.

A number of valuable publications have been received in the course of the year, and the Director desires to record his grateful acknowledgments to the donors. A list is appended.

Lectures.

Lectures have been given by the Director in the October Term 1913 on Solar Research, and by Mr Stratton in the Easter Term 1913, and the Lent Term 1914, on Stellar Physics.

The Director desires to record his appreciation of the hearty cooperation of the staff throughout the year.

H. F. NEWALL.

Solar Physics Observatory,
1914 *May* 16.

The Director gratefully acknowledges the receipt of the following works, which have been presented to the Library of the Solar Physics Observatory:

	Donors.
Antwerp, Société d'Astronomie. Gazette Astronomique. Nos. 65—77. Anvers, 1913, 1914. 4to.	The Society.
Antwerp, Société d'Astronomie. Neuvième Rapport. 1913. Anvers, 1914. 8vo.	,,
Astrophysical Journal. Vol. xxxvii. No. 3, to Vol. xxxix, No. 2. Chicago, 1913–14. 8vo.	Prof. Newall.
Berlin, Königliche Sternwarte. Beobachtungs-Ergebnisse, No. 15. Berlin, 1913. 4to.	The Observatory.
Brussels, Observatoire Royal de Belgique. Annales Astronomiques. Vol. xiv. fasc. i. Brussels, 1913. 4to.	,,
Cartuja, Observatorio Astronómico. Estadística Foto-heliográfica, 1912. 8th year, Nos. 1—4. Granada, 1913. Fol.	,,
Copenhagen, Observatorium. Publikationer og mindre Meddelelser. Nos. 12—18. København, 1913–14. 4to and 8vo.	,,
Greenwich, Royal Observatory. Photo-heliographic Results, 1912. London, 1913. 4to.	,,
Greenwich, Royal Observatory. Position of the Sun's Axis, 1874—1912. London, 1913. 4to.	,,
Göttingen, Königliche Sternwarte. Astronomische Mitteilungen, Nos. 15, 16. Göttingen, 1913. 4to.	,,
Harvard College Observatory. Twenty-six volumes of Annals. Cambridge, Mass., 1871—1913. 4to.	,,
Harvard College Observatory. Circulars 1—174, 176—182. Cambridge, Mass., 1895—1914. 4to.	,,

	Donors.
Heidelberg, Grossherzogliche Sternwarte. Veröffentlichungen. Vol. VII. Nos. 1—4. Heidelberg, 1913. 4to.	The Observatory.
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